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Short Communication

The art of dieting: Exposure to thin sculptures effortlessly reduces the intake of unhealthy food in motivated eaters

Aline E. Stämpfli [a,b,*], Thomas A. Brunner [b]

[a] University of Bern, Institute of Marketing and Management, Department of Consumer Behavior, Engehaldenstrasse 4, 3012 Bern, Switzerland
[b] Bern University of Applied Sciences, School of Agricultural, Forest and Food Sciences HAFL, Food Science and Management, Länggasse 85, 3052 Zollikofen, Switzerland

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ABSTRACT

Thin, human-like sculptures by the artist Alberto Giacometti, applied as environmental cues, have been found to facilitate dieting by reducing chocolate intake and promoting healthy snack choices. However, the processes underlying this "Giacometti effect" have been left unexplored so far. The present study therefore first examines the effortlessness of the effect. More specifically, it aims to determine whether the sculptures reduce unhealthy food intake when only few cognitive resources for their influence are available. For this purpose, the participants in a chip tasting were given the cognitive load task of memorizing either 10 or two digits during the tasting. The results indicate that the sculptures reduced participants' chip intake independent of the cognitive load. Thus, they influenced participants' eating behavior even when only few cognitive resources were available. The results also indicate that the sculptures reduced chip intake only when the participants liked the chips. The sculptures could thus exert their influence when individuals were motivated to eat and the dieting cues were useful. The finding that the Giacometti sculptures, applied as environmental dieting or health cues, influenced individuals when only few cognitive resources were available, could indicate a crucial advantage for the application of these cues in complex, real-world settings.

1. Introduction

Many people may consider dieting to lose weight for health reasons or to conform to today's ideal of thinness. However, as evidenced by the global obesity epidemic, successfully pursuing a dieting goal is challenging. Generally, there are two ways to pursue a goal: a rather effortful and a rather effortless one (see dual-process models; e.g., Kahneman, 2003). Traditionally, effortful conscious reflection and intent have been considered to drive goal pursuit (Aarts, 2007; e.g., Ajzen, 1991). However, promising research has shown that environmental cues may be able to help individuals achieve their goals more effortlessly (see Wansink & Chandon, 2014). For example, a poster on the door of a butcher's store announcing a recipe that was "good for a slim figure" was found to reduce the amount of unhealthy samples dieters ate while in the store (Papies & Hamstra, 2010). Other studies have examined thin, human-like sculptures by the artist Alberto Giacometti as environmental health cues (Brunner & Siegrist, 2012; Stöckli, Stämpfli, Messner, & Brunner, 2016). These sculptures have been shown to reduce participants' chocolate intake in the laboratory (Brunner & Siegrist, 2012) and to increase the share of consumers' healthy snack choices at vending machines (Stöckli et al., 2016).

However, the processes underlying this "Giacometti effect" have been left unexplored so far. The present study aims to shed some light on these processes by examining the effortlessness of the effect. More specifically, the goal of this study is to determine whether Giacometti sculptures, applied as environmental cues, can reduce unhealthy food intake, even when only few cognitive resources for their influence on eating are available.

1.1. When environmental cues serve as health primes

The first indications of the Giacometti effect's underlying processes can be found in the literature on priming in health behavior (see Sheeran, Gollwitzer, & Bargh, 2013). This research indicates that environmental cues can act as primes. Primes work by temporarily activating mentally represented constructs, such as goals, outside of individuals' awareness (Aarts, 2007; Bargh & Chartrand, 2000; Bargh, Gollwitzer, Lee-Chai, Barndollar, & Trötschel, 2001; Papies & Aarts, 2010). These goals can then influence behavior.

* Corresponding author.
E-mail addresses: aline.staempfli@imu.unibe.ch (A.E. Stämpfli), thomas.brunner@bfh.ch (T.A. Brunner).

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For example, television commercials with slim models or dieting-related products reduced the caloric intake of dieters (Anschutz, van Strien, & Engels, 2008). Similarly, diet reminders in restaurant menus influenced dieters to more frequently choose low-calorie dishes over higher-calorie options (Papies & Veling, 2013).

In accordance with the mechanism of priming, individuals are typically unaware of being influenced by environmental cues (Chartrand, 2005). Either way, the cues' influence does not seem to depend on this awareness. Even if an individual thinks about an environmental cue while being influenced by that cue, the cue's effect does not seem to be altered. For example, a health-related recipe flyer reduced unhealthy snack purchases in a grocery store among overweight customers regardless of whether or not they had been thinking about the flyer while shopping (Papies, Potjes, Keesman, Schwinghammer, & van Koningsbruggen, 2014). Regarding whether the awareness of a cue at the time of initial exposure alters the cue's influence, there is contrasting evidence (Harris, Bargh, & Brownell, 2009; Papies et al., 2014).

In conclusion, if environmental cues influence food decisions even when individuals do not consciously think about these cues while being influenced by them (Papies et al., 2014), then environmental cues may work without much effort on the part of the individual.

1.2. How effortless environmental cues work

However, unconsciousness and effortlessness do not always go hand in hand (Bargh, 1994; Papies & Aarts, 2010; Ward & Mann, 2000). On the one hand, unconscious goal priming can occupy at least some mental resources, as shown by the effects of priming on performance in effortful working memory tasks. While priming for achievement improved individuals' performance on effortful working memory tasks, priming for an unrelated goal reduced performance (Hassin, Aarts, Eitam, Custers, & Kleiman, 2009). On the other hand, effortless processes can still have some conscious elements. For example, typing on a computer or driving a car are both activities that can be performed quite effortlessly, but both are still consciously started and stopped (Bargh, 1994). Therefore, the study of the effortlessness with which environmental cues work should rely on research that examines priming under conditions of different degrees of cognitive resources available, e.g., by applying a cognitive load (Bargh & Chartrand, 2000).

Such research has indicated that priming effects do not depend on the cognitive load. For example, individuals were found to recognize a goal more quickly following exposure to a relevant prime regardless of whether they had memorized nine digits during the lexical decision task (Fishbach, Friedman, & Kruglanski, 2003). Similarly, regardless of whether a cognitive load was induced, individuals exposed to fruit and vegetable advertisements were more likely to choose fruits over unhealthy snacks than those not primed by fruit and vegetable advertisements (Forwood, Ahern, Hollands, Ng, & Marteau, 2015).

1.3. Pursuing a dieting goal with or without effort

Although evidence to support this hypothesis is scarce (Fishbach et al., 2003; Forwood et al., 2015), Giacometti sculptures, when placed as environmental cues, may activate a dieting goal and influence an individual's eating behavior without much effort on the part of the individual. However, some effortful processes may also be at work for this effect. The thin sculptures may influence individuals by making them explicitly think about their own weight (Van de Veer, van Herpen, & van Trijp, 2015).

In the present study, we aimed to test the effortlessness with which the Giacometti sculptures work by inducing a cognitive load during a potato chip tasting. If the sculptures influenced the participants' food intake independent of the cognitive load, and thus also when only few cognitive resources were available, an effortless influence of the sculptures would be indicated. In contrast, if the cues only had an impact when the participants were not cognitively loaded, this would indicate that the Giacometti sculptures require cognitive resources to influence eating.

2. Study

2.1. Materials and methods

2.1.1. Participants

Members of a sensory consumer panel were invited to a sensory laboratory for a chip tasting. The chip tasting served as the cover story for the study. Because the consumer panel members had previously acted as participants in food taste tests, it can be assumed that they did not suspect that the evaluation of the tasted chips was not the main interest of the present study. No additional cover story was given to the participants regarding the additional tasks they had to complete or questions they had to answer. One hundred and thirty-seven panelists participated in the study, each receiving a compensation of 25 Swiss francs.

Nine participants were excluded from the analyses because they had difficulty memorizing or remembering the 10 digits in the cognitive load task. Two of them admitted that they had not attempted to memorize the digits, while the other seven remembered the correct place of less than six of the digits and, in addition, rated the memorization task as not being difficult. Data from the remaining 128 participants were used for the analyses (M_{age} = 46.35 years, SD_{age} = 14.20; 73.44% female).

2.1.2. Design

A 2 (cue vs. no cue) × 2 (high vs. low cognitive load) between-subjects design was applied. About half of the participants entered the laboratory in the cue condition, where screensavers with thin, human-like sculptures by the artist Alberto Giacometti were running on the computer screens in the cubicles. The other participants found the computers protected by white screensavers.

For the cognitive load task, again about half of the participants memorized a 10-digit number within 30 s. The other participants received a low cognitive load; they were given the task of memorizing a two-digit number within 30 s.

2.1.3. Materials

The Giacometti screensaver was created using a picture showing three thin figures from Giacometti's sculpture *Piazza*. To generate a realistic screensaver appearance, the picture was moving in front of a black background. The neutral screensaver showed a static white picture. The 10-digit number was 5826748139. To ensure a high cognitive load, care was taken to avoid common sequences of digits. The two-digit number was 47. Participants completed a computer-based questionnaire.

The chips used in the tasting were Pringles Original. Each participant was served 20 chips. On average, the sample of chips provided to each participant weighed 46.83 g (SD = 1.14; minimum 44.00 g, maximum 51.00 g).

2.1.4. Measures

The main variable in this study was *consumption volume*. To measure this dependent variable, the weight difference between the original amount of chips (20) given to the participants and the chips remaining after the participants had completed the tasting was calculated.

Information on the participants' *liking of the chips* was collected during the tasting. Two questions concerned the flavor of the chips,

while one involved the appearance and one the participants' willingness to buy the chips ($\alpha = .83$). The responses to the items "*These chips taste very good*," "*These chips look appealing*," and "*If these chips were available at an appropriate price where I normally shop, I would buy them*" were collected on a 7-point Likert scale (1 = "*I do not agree at all*"; 7 = "*I entirely agree*"; note: the items and scale items were translated from German). The responses to the fourth item, "*Compared to the best chips I have ever eaten, these chips taste...*", were collected on a 7-point scale from "*a lot worse*" to "*a lot better*".

For the cognitive load manipulation check, participants' subjective feeling of effort regarding the cognitive load task was collected on a 7-point Likert scale. Participants were asked how demanding it was for them to evaluate the chips in the tasting while keeping in mind the memorized number. They also had to state their approval when answering the reverse-coded item: "*It was easy to remember the number*" ($\alpha = .84$).

The participants in the cue condition were also asked if they remembered the screensaver on their screen at the beginning of the study, a question they answered with a "*yes*" or "*no*" response. If they answered "*yes*," they were asked to describe the screensaver in an open format. The participants in the cue condition were also asked, using a 7-point scale, to assess the degree to which they believed the screensaver influenced how many chips they had eaten during the tasting.

2.1.5. Procedure

When the participants arrived at the sensory laboratory, they were welcomed and given the initial instructions in front of the laboratory's closed door. The participants then entered the room, chose a cubicle, and seated themselves. During this time, they were exposed to the screensavers for approximately 30 s. The experimenter then gave the participants the input to start the questionnaire by pressing a certain key on the computer keyboard. At the beginning of the questionnaire, the participants were given the cognitive load task of memorizing either 10 digits or two digits. Afterwards, each participant was served 20 chips on a plate. The participants tasted and rated the chips for five minutes. They had been instructed to eat as many chips as they wanted. After the tasting, the participants were asked to recall the digits from the cognitive load task as precisely as possible. Finally, the participants completed the rest of the questionnaire.

2.2. Results

2.2.1. Manipulation check

The manipulation check indicated that the cognitive load manipulation had been successful. That is, it was a more cognitively demanding task for participants to remember the 10-digit number ($M = 4.99$, $SD = 1.59$) than it was for the other participants to remember the two-digit number ($M = 1.21$, $SD = 0.62$), $t(126) = 17.67$, $p < .001$, $d = 3.12$.

2.2.2. Effortless Giacometti effect

A two-factor ANOVA, which examined the effects of the *cue*, *cognitive load*, and their interaction on *consumption volume*, revealed that the Giacometti screensaver reduced the amount of chips participants ate (see Fig. 1); main effect of *cue*, $F(1, 124) = 4.70$, $p = .032$, $\eta_p^2 = .04$. The participants who had been exposed to the Giacometti screensaver consumed less ($M = 11.48$ g, $SD = 6.18$) than the participants who had been exposed to the neutral white screensaver ($M = 14.56$ g, $SD = 9.37$), $t(126) = 2.18$, $p = .031$, $d = 0.39$. The Giacometti effect occurred independently of the cognitive load; that is, it occurred when participants had memorized a two-digit number, as well as when they had memorized a 10-digit number; interaction of *cue* and *cognitive load*, $F(1, 124) = 0.71$, $p = .400$, $\eta_p^2 = .01$. The cognitive load itself did not influence the amount of chips consumed; main effect of *cognitive load*, $F(1, 124) = 0.01$, $p = .907$, $\eta_p^2 = .00$.

Regarding the influence of the Giacometti screensaver independent of the cognitive load, a Bayesian model comparison revealed that the model that only considered the effects of the cue and cognitive load explained the data almost three times better than the full model, which also included the interaction between the two variables. This substantiated that the cognitive load did not have an influence on the Giacometti effect (see Kruschke, 2011).

Since the Giacometti screensaver also influenced intake when cognitive resources were reduced, the assumption that the cue influenced intake effortlessly is supported. In terms of the consciousness of the environmental cue and its influence, the results showed that 96.72% of the participants in the cue condition did not think that they had been influenced by the screensaver, but that 75.41% of the participants in the cue condition remembered the details of the cue itself. More specifically, 52.46% remembered seeing Giacometti's sculptures or mentioned words related to thinness, while 22.95% remembered seeing figures or humans. However, the participants who remembered the details of the Giacometti screensaver did not eat more or less ($M = 11.48$ g, $SD = 5.53$) than the participants who did not remember them ($M = 12.20$ g, $SD = 7.72$), $t(59) = 0.40$, $p = .693$, $d = 0.11$.

2.2.3. How liking facilitates the Giacometti effect

Because the cognitive load neither influenced participants' consumption volume nor the cue's effect on consumption volume, we omitted cognitive load in the remaining analyses. An ANCOVA, which examined the effects of the *cue*, *liking of chips*, and their interaction on *consumption volume*, revealed that the Giacometti effect was facilitated by participants' liking of the tasted chips (see Fig. 2); interaction of *cue* and *liking of chips*, $F(1, 124) = 4.21$, $p = .042$, $\eta_p^2 = .03$; main effect of *cue*, $F(1, 124) = 1.65$, $p = .201$, $\eta_p^2 = .01$. The Giacometti screensaver had an influence when the participants liked the chips, upwards of 3.81 on the 7-point scaled moderator variable liking of chips. This result was gained using the Johnson–Neyman technique, whereby the transition point from insignificant to significant of the conditional effect of the cue on consumption volume along the moderator variable continuum (liking of chips) was mathematically derived (Hayes, 2013; with a significance level of $\alpha = .05$). Examining the mean of liking of chips, plus/minus one standard deviation, substantiated that those participants who had relatively high ratings for liking of chips were influenced by the cue, $\theta_{(X\rightarrow Y)|M+1SD=5.23} = -5.84$, $t(124) = 3.05$, $p = .003$; $\theta_{(X\rightarrow Y)|M=3.97} = -3.04$, $t(124) = 2.26$, $p = .026$, whereas those participants who had relatively low ratings were not influenced by the cue, $\theta_{(X\rightarrow Y)|M-1SD=2.72} = -0.25$, $t(124) = 0.13$, $p = .897$. Liking, in general, increased participants' consumption volume; main effect of liking of chips, $F(1, 124) = 8.66$, $p = .004$, $\eta_p^2 = .07$.

3. Discussion

The present study examined how thin, human-like sculptures by the artist Alberto Giacometti reduced unhealthy food intake when used as subtle environmental cues. Prior to this study, the processes underlying the Giacometti effect were largely unexplored (Brunner & Siegrist, 2012). As such, the aim of this study was to examine the question of the effortlessness with which the cues influenced food intake. Therefore, we induced a cognitive load during a chip tasting. The results of this study revealed that the sculptures reduced chip intake independent of cognitive load, which indicated that the sculptures also exerted their influence when only few cognitive resources were available.

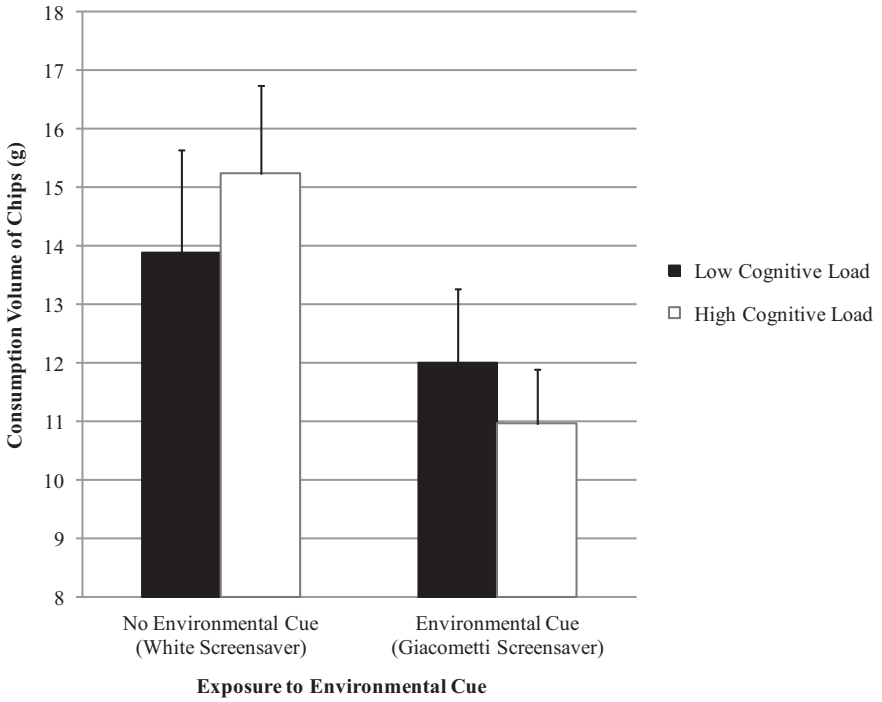

Fig. 1. Mean consumption volume of chips (in grams) for the four conditions (cue/no cue × low/high cognitive load). Participants exposed to a screensaver with thin Giacometti sculptures consumed fewer chips than participants exposed to a neutral white screensaver. Cognitive load did not alter this effect (error bars represent standard errors).

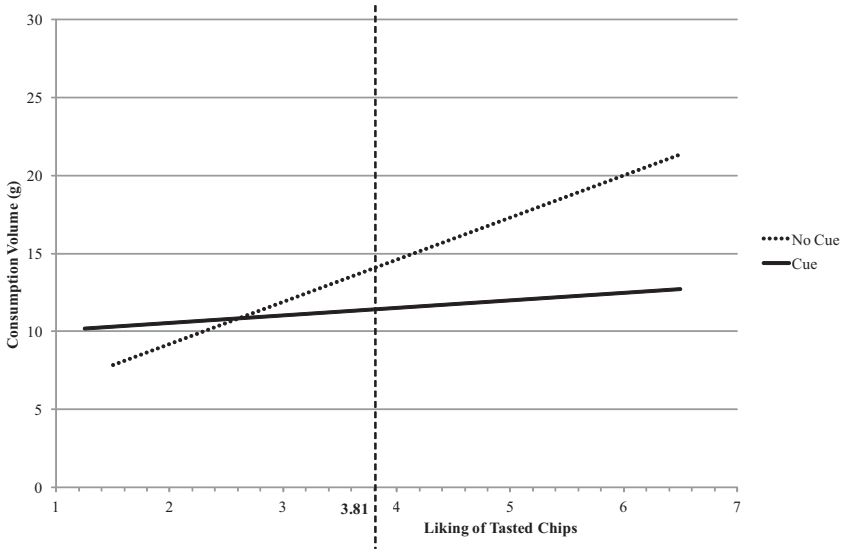

Fig. 2. Chip consumption as a function of liking of the tasted chips and exposure to an environmental cue. A screensaver with Giacometti sculptures reduced the chip intake of participants who liked the chips tasted (significant influence of the cue's conditional effect on consumption volume upwards from 3.81 on the moderator variable liking of chips).

This effortlessness of the cues' influence seems to be a crucial advantage for the effectiveness of dieting cues in complex, real-world settings, in which individuals have limited cognitive resources with which to confront a multitude of demands (Bargh & Chartrand, 2000; Papies et al., 2014). In such circumstances, information-based approaches, such as disclosing calorie information, have proved to be unsuccessful (Downs, Loewenstein, & Wisdom, 2009). The use of dieting cues that involve little effort on the part of the individual also seems to be an effective strategy regarding the general lack of attention individuals pay to their everyday eating behavior. That is because when attention lies elsewhere, cognitive resources for the control of food intake are impaired (Van de Veer et al., 2015), but effortless influences can take place. The use of environmental cues for an improved eating behavior is further a more efficient method than mindfulness interventions, such as mindful attention exercises related to food. These tend to be time costly (Papies, Pronk, Keesman, & Barsalou, 2015).

However, each environment contains its own unique set of cues. Which one of these various environmental cues asserts itself

in real-world settings—for example, in a supermarket, where individuals are exposed to package claims, atmospheric cues, and the palatable products themselves—will also depend on each individual's own goals and motivations (Aarts, 2007; Papies & Aarts, 2010). In the present study, the Giacometti cues were shown to reduce participants' unhealthy food intake when participants liked the chips they tasted. Thus, the cues exerted their influence when the participants were motivated to eat, or in other words, when the goal of eating was active. Environmental cues have been shown to have a greater influence on behavior when relevant goals are active (Forwood et al., 2015; Papies & Hamstra, 2010). Because goals are embedded within associative knowledge structures that contain goal-related content (Aarts, 2007; Papies & Aarts, 2010), environmental cues associatively linked to a goal should influence behavior when the respective goal is active. In the present study, we assume that when individuals liked the chips they tasted, the goal of eating was activated, and because of the associative link between eating and thin figures, the thin sculptures influenced the individuals. Although the goal of eating enjoyment has been shown to inhibit the weight control goal (see goal conflict model of eating, Stroebe, van Koningsbruggen, Papies, & Aarts, 2012), there are some individuals for whom eating-related cues seem to heighten the accessibility of the dieting goal. These individuals seem to have developed facilitative links between eating-related cues and dieting goals due to repeated self-control exertion in the past (Fishbach et al., 2003). It would be interesting to further examine variables such as successfully exerted self-control in follow-up studies. In sum, the present study showed that the Giacometti sculptures reduced unhealthy food intake when individuals were motivated to eat—that is, when a health cue was actually needed.

There are several other important questions not addressed by the present study, as well as a few limitations to the present study. One of the limitations is that the participants did not eat a vast amount of chips. They ate on average about one third of the 20 chips they had received. This can be attributed to the cover story, the chip tasting. Thus, the difference in the consumption volume of chips between primed and unprimed participants amounted only to 3.08 g. To conduct the present study using a cover story that allows participants to eat more might substantiate the obtained results. Participants should have the opportunity to eat for a longer time period, for example, while watching a film. Another limitation lies in the generalizability of the effect of the Giacometti cues and other environmental cues related to food intake. Thus far, to our knowledge, these have been tested only in the laboratory (present study; Brunner & Siegrist, 2012; other cues, e.g., Brunner, 2010) and the field (Stöckli et al., 2016; other cues, e.g., Papies & Hamstra, 2010; Papies et al., 2014; Papies & Veling, 2013). Therefore, it would be interesting to observe the effectiveness of these cues in the home environment. This involves two crucial questions regarding environmental cues. First, there is a lack of evidence regarding how the influence of an environmental cue develops when the cue is applied repeatedly. Habituation processes could either weaken or maintain the cue's effect (see results on repetition priming, e.g., Martens & Gruber, 2012). The second question concerns whether people could use such cues intentionally to facilitate their health or dieting behaviors.

To further explore the application of a cue in the home environment, it would be important to determine which goal or concept the applied cue activates; this matter was not addressed by the present study. The thin sculptures could have activated a health-related goal, or—as we assume—a more specific, weight-related goal or mental concept (Brunner & Siegrist, 2012). The actual underlying goal or concept could be determined using implicit measurement methods, such as a word completion task. Additionally, a laboratory experiment using a between-subjects design to compare the cues' influence on unhealthy and healthy food intake could give further indications of which goal or concept is activated by the Giacometti sculptures. If the cues were to activate a weight-related concept, we would expect them to reduce unhealthy and healthy food intake equally. On the contrary, if the cues were to activate a health-related concept, we would expect them to reduce unhealthy food intake and to promote or, at least, to not decrease healthy food intake. When the purpose of a cue is to activate a broader health goal, the application of sculptures that are not as unnaturally thin as the Giacometti sculptures may be ideal. However, there is contrasting evidence for the appropriateness of using healthy-looking models to influence food intake (Anschutz, Engels, Becker, & van Strien, 2008).

In general, it is important to have a realistic understanding of the impact of environmental cues. As mentioned, an applied cue is one of various cues found in complex, real-world settings. Which of the many cues present affects an individual's behavior depends on many factors, including the individual's mental concepts. Further, it is not known how long the activation of a mental concept by a distinct cue will persist, or on which factors this duration may depend. Finally it is important to note that weight loss is a complex goal that requires different behaviors to be achieved (Papies & Aarts, 2010)—for example, activity-related behaviors in addition to eating-related behaviors.

In sum, the present study showed that thin, human-like sculptures by the artist Alberto Giacometti, when applied as environmental cues, could facilitate dieting by effortlessly reducing motivated eaters' unhealthy food intake. Applying environmental cues that influence food intake effortlessly seems to correspond with the approach of nudging individuals toward self-interested behavior (Thaler & Sunstein, 2009) and with the World Health Organization's approach to facilitating dieting through "making healthy choices easy choices" (World Health Organization, 2015).

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Conflict of interest

All authors declare that they have no conflicts of interest.

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